Forest height estimation in a tropical forest context from PolInSAR measurements: Illustration from the TropiSAR campaign in French Guyana

Details

Meeting	2010 Fall Meeting
Section	Biogeosciences
Session	Ecological Significance of Forest Structure From Remote Sensing, Modeling, and Field Measurements I Posters
Identifier	B33H-0466
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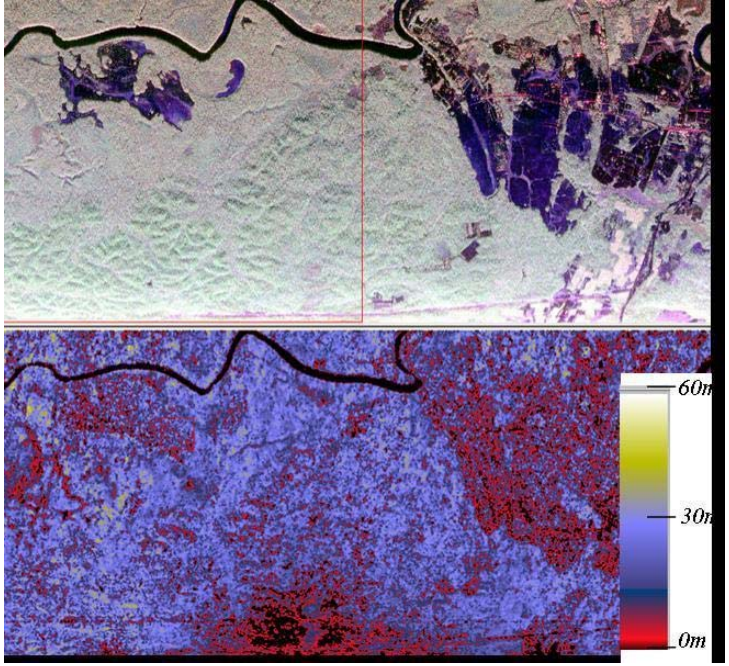
Index Terms	Ecosystems, structure and dynamics [0439] Remote sensing [0480]

Abstract

The BIOMASS mission was retained in January 2009 as one of the three candidates for the next Earth Explorer Core mission to go to phase A. BIOMASS main objective is to provide information on the carbon sinks and sources in the forests globally, which will be of essential value for climate modelling and policy adaptation, e.g. REDD. Up to now, biomass retrieval algorithms have been developed and validated for the range of biomass up to 300 t/ha. The methods are based on combining SAR intensity and SAR Polarimetric interferometry (PolInSAR) which provide respectively estimates of biomass and canopy height. The remaining questions concern the overall performance of the retrieval algorithms in tropical forests characterized by high biomass density (> 300 t/ha) and complex structure. The TropiSAR experiment in French Guyana was proposed to provide feedbacks on the performances of a P-band SAR to measure biomass and canopy height of a tropical forest with higher biomass density. Characterising tropical forests is essential as it represents a large component of the terrestrial carbon pool and the carbon sources. Specifically, TropiSAR was designed to provide measurements of temporal coherence at P-band over tropical forests for time intervals compatible with space-borne missions (typically 20-30 days), to assess performances of methods transforming P-Band SAR intensity and interferometric measurements into forest biomass and forest height. The SAR system is the ONERA airborne system SETHI that flew in French Guyana in August 2009. This paper presents the first results from this analysis. The temporal coherence at P-band over tropical forests is observed to remain high even after 22 days, a time interval period compatible with typical SAR orbit cycle. The vegetation height map estimated from Polarimetric interferometry is shown to be in good agreement with Lidar measured heights and the in-situ measurements in the study area. The PolInSAR derived height captures the main structural features of the studied forests.



SAR image of the area (R:HH,G:HV,B:VV) and PolInSAR derived height map. The black areas are areas where the inversion was not possible.

Cite as: Author(s) (2010), Title, Abstract B33H-0466 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.